# MIDFIELD Institute Introduction

MIDFIELD INSTITUTE 2023

*Share why you are here in the chat.* ☺

MIDFIELD
Multiple-Institution Database For Investigating Engineering Longitudinal Development


## to the Third MIDFIELD Institute!

Thanks for coming!!

MIDFIELD
Multiple-Institution Database For Investigating Engineering Longitudinal Development

**Based on support from NSF award 2142087**

## Everything you need…

Is available on the website!

Recommend bookmarking the program (agenda)!

We will build in breaks!

MIDFIELD Institute

- Welcome
- Introduction
- Before you arrive
- Program
- Tutorial links
- R resources
- License

### Welcome

**2023 MIDFIELD Institute**
Location: Virtual
Date: July 11–14
Time: 1–5 pm Eastern Time (US)

**Registration.** C
interested in a
email Susan Lo
line *Register fo*

https://midfieldr.github.io/2023-midfield-institute/

## Facilitators

MIDFIELD
Multiple-Institution Database For Investigating Engineering Longitudinal Development

**Matthew Ohland**, MIDFIELD Director/PI
Associate Head and Professor of Engineering Education, Purdue

**Russell Long**, MIDFIELD Managing Director

**Richard Layton**, MIDFIELD Data Display Specialist
Emeritus Professor of Mechanical Engineering, Rose-Hulman

**Marisa Orr**, MIDFIELD Associate Director
Associate Professor of Mechanical Engr/ Engr & Science Ed, Clemson

**Susan Lord**, MIDFIELD Institute Director
Professor and Chair of Integrated Engineering, University of San Diego

# Facilitators

**Haleh Barmaki Brotherton**, PhD student, Engineering and Science Education, Clemson University

**Hayaam Osman**, PhD Student, Engineering Education, Purdue University

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# Workshop Objectives (qualitative)

By the end of the MIDFIELD Institute, participants should be able to

- Describe the data available in MIDFIELD
- Describe how the MIDFIELD data are organized
- Describe key principles of effective data visualization
- Draft a research question that can be addressed using MIDFIELD

# Workshop Objectives (computational)

- Use **midfieldr**, an R package specifically designed for use with MIDFIELD, to:
  - Subset MIDFIELD data to obtain a population to study
  - Classify student records by desired groupings
  - Summarize the data by groups and display results

# Session 1: MIDFIELD Introduction

## By the end of this session, you will be able to

- Describe where MIDFIELD comes from and how that affects research
- Describe different types of studies that can be done with MIDFIELD
- Outline process to join and access MIDFIELD

**M**ultiple
**I** nstitution
**D**atabase
**F** or
**I** nvestigating
**E** ngineering
**L** ongitudinal
**D** evelopment

Whole-population data for institutions and time period

- No sampling, longitudinal, intersectional analyses

Current dataset (July 2023)

- 21 institutions NOT JUST ENGINEERING!!
- > 2.4 million unique students in all majors at institution
- > 240,000 unique engineering students, approximately 1/7 US engineering enrollment

Began with partners in the Southeastern University and College Coalition for Engineering Education (SUCCEED)

## Is MIDFIELD representative?

- To the extent that we could measure, MIDFIELD is representative of national (USA) data in terms of race and sex for engineering overall and for "top 5 engineering fields" (Chemical, Electrical, Mechanical, Civil, and Industrial) at enrollment and graduation
- Hard to find datasets to compare to!

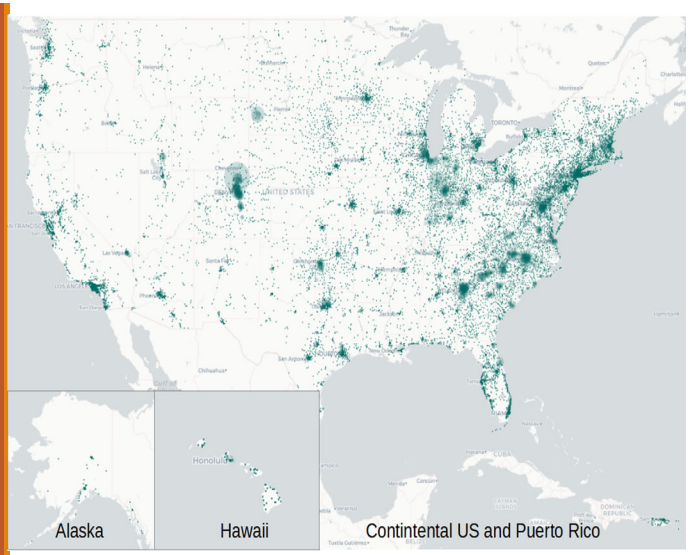
| ASEE AMERICAN SOCIETY FOR ENGINEERING EDUCATION | MIDFIELD Multiple-Institution Database For Investigating Engineering Longitudinal Development |
|---|---|
| Cross-sectional data for enrollment and degrees awarded by year (2013 used in this study) | Longitudinal: Multiple data points per student (1987 – 2014) |
| 349 institutions including public and private | Whole-population data |
| Engineering majors only | 11 institutions, large public |
| >500,000 engineering students in 2273 engineering programs | >1 million students, all majors |
| | > 200,000 engineering students: 10% of engineering enrollment |

M. K. Orr, M. W. Ohland, S. M. Lord, and R. A. Layton, "Comparing the Multiple-Institution Database for Investigating Engineering Longitudinal Development with a National Dataset from the United States," *International Journal of Engineering Education*, **36**(4), 1321-1332, 2020.

## How the design of MIDFIELD affects research

- Southeastern bias – population growth / diversification
- "Large institution" bias – the experience of students at smaller institutions isn't well-represented
- Public institution bias – the experience of students at private institutions isn't well-represented
- Two HBCUs – can't discuss the "typical experience"
- No HSIs or institutions with high Asian student enrollment, institutions with larger populations being added

Students in MIDFIELD based on home zip code




# Resources to help in using MIDFIELD

midfielddata

https://midfieldr.github.io/midfielddata/

midfielddata

Sample of the MIDFIELD Student Unit Record Data

The goal of midfielddata is to provide a sample of MIDFIELD data for practice working with longitudinal, de-identified, individual student unit records.

midfieldr

https://midfieldr.github.io/midfieldr/

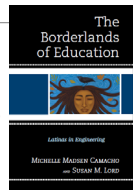
midfieldr

Tools for Studying MIDFIELD Student Unit Record Data in R

The goal of midfieldr is to provide tools for working with MIDFIELD data, a resource of longitudinal, de-identified, individual student unit records.

## What have MIDFIELD researchers accomplished?

- Many publications in journals and conference proceedings, conference presentations, multiple book chapters, & a book.
- 5 journal best paper awards (JEE, IEEE ToE), 2 conference best paper awards, and other recognitions (e.g., WEPAN, ECEDHA).
- Panel discussions, invited workshops and talks, keynote addresses, publicity in various media outlets.







## MIDFIELD Impact: Research

- Citations - thousands
- Promoting the use of more sophisticated graphical displays
- Promoting an intersectional approach
- Promoting ecosystem thinking
- Promoting the use of new metrics

## MIDFIELD Impact: Policy and Practice

- Citations of our work in papers describing
  - How our metrics and/or graphical displays are being used by others
  - Cases of policy and practice reform based on MIDFIELD findings
- Example: *change in policy* – changed criteria for continuing study
- Example: *new program creation* – the University of Colorado's Gold Shirt program

SHORTEN THIS



## Accessing the Data

- Contact Russell Long (ralong@purdue.edu)
- Consult local IRB
- Sign a confidentiality agreement (graduate students need advisor to sign too ☺)

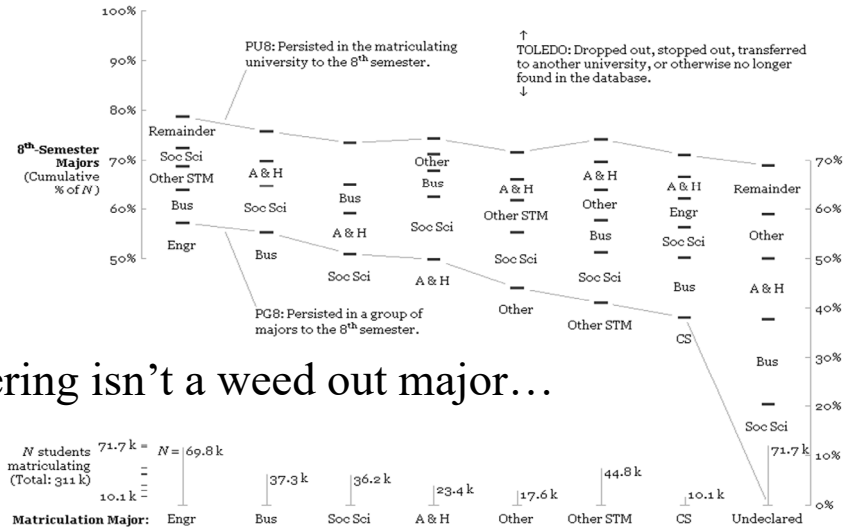
## Joining MIDFIELD

- Identify someone at your institution with authority to share institutional data
- Facilitate a meeting of that person with Russell Long, Matt Ohland, and Joe Roy (of ASEE)

ASEE | MIDFIELD
Multiple-Institution Database for Investigating Engineering Longitudianl Develoment

## Some award-winning results from research using MIDFIELD

MIDFIELD
Multiple-Institution Database For Investigating Engineering Longitudinal Development




# Engineering isn't a weed out major…

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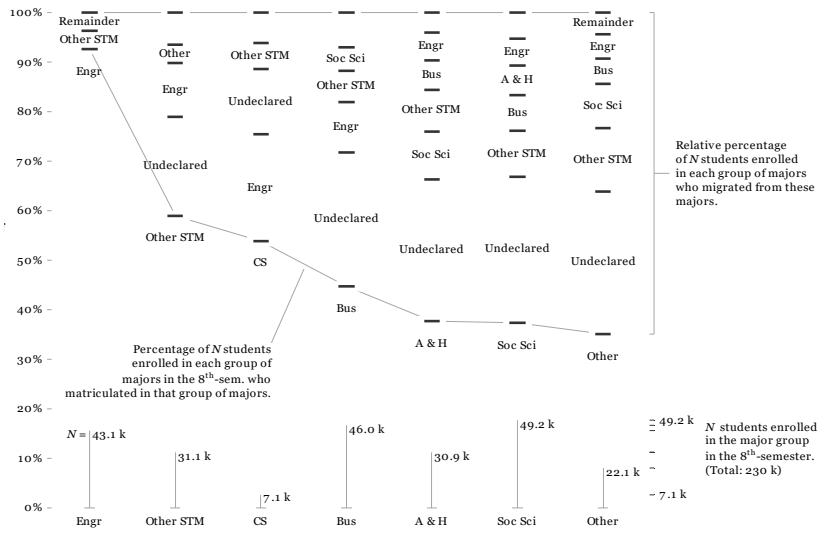
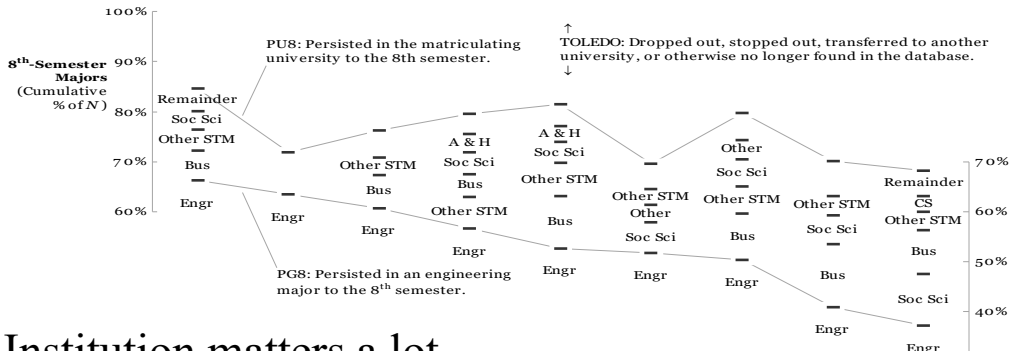
**Students Matriculating in All Majors:** all MIDFIELD institutions, 'native' (non-transfer) students.




**Groups of 8th-Semester Majors.**
All MIDFIELD institutions, 'native' (non-transfer) students.

it just doesn't replace the students it loses.



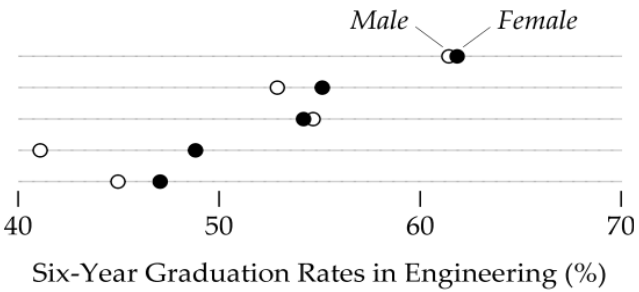

# Institution matters a lot…


**Students Matriculating in Engineering**, By institution, 'native' (non-transfer) students.

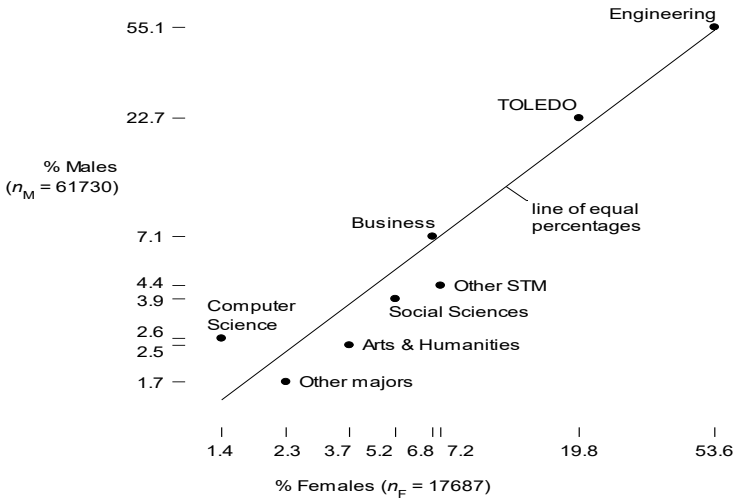
# Women graduate at the same rates as men…

***All Engineering Matriculants***

| | $n_F$ | $n_M$ |
|---|---|---|
| Asian | 1001 | 3927 |
| Hispanic | 390 | 1607 |
| White | 9997 | 45291 |
| Black | 3957 | 6624 |
| Native-Am | 68 | 258 |

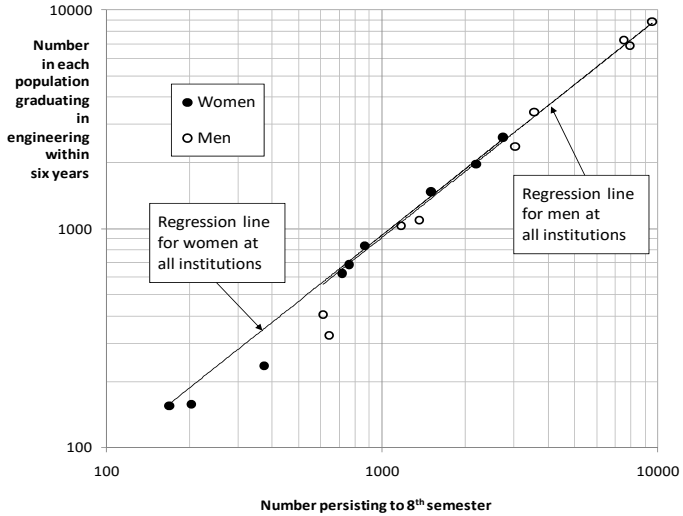


# …and have surprisingly similar outcomes.

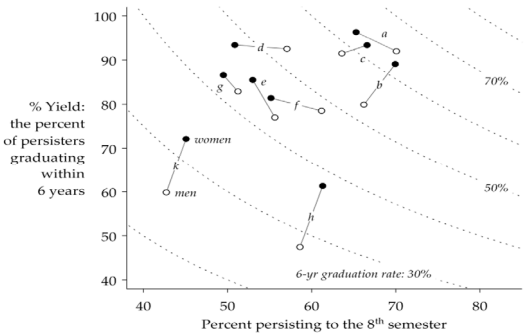


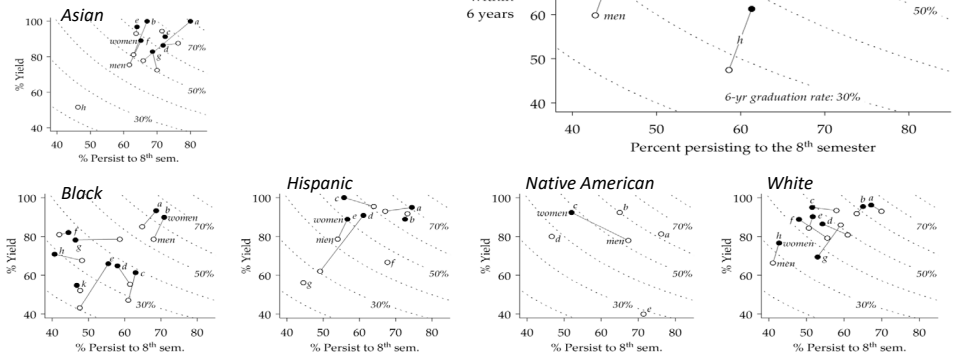



# Eight-semester persistence is a good predictor of six-year graduation… but not for everyone.

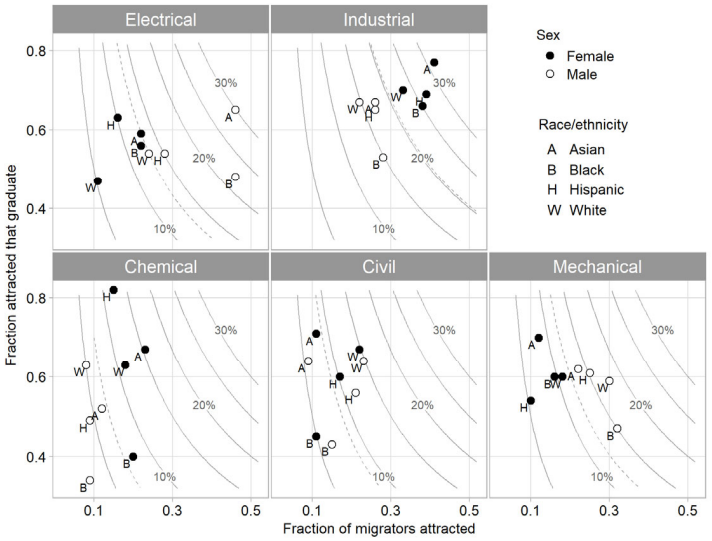



# The aggregate doesn't represent any racial/ethnic group.




# Some disciplines show gender differences …others show racial/ethnic differences.



Some disciplines are better than others at graduating students… but some of the students who leave will graduate in other engineering majors.